Remarks/Arguments:

No amendments to the claims are made with this response.

Claims 36 and 37 are newly added. New claim 36 recites an emission control system comprising "a lean NOx catalyst system consisting of a platinum catalyst having a loading of $<30g/ft^3$ coated on a surface area-enlarging washcoat, for reducing NOx to N_2." New claim 37 recites a method of passing exhaust gas over the lean NOx catalyst system quoted above. The applicant submits that new claims 36 and 37 are distinguishable over Tsuchitani in that Tsuchitani does not disclose a lean NOx catalyst system that consists only of a platinum catalyst that reduces NOx to N_2. Support for claims 36 and 37 is found throughout the specification, particularly page 3, third paragraph of the published application. No new matter has been added.

Claims 9-12, 14-16, 18, 21-30, 32, 34-37 are thus pending. Claims 21-30, 32, and 34 are directed to a process for the control of emissions from a lean-burn internal combustion engine. Claims 9-12, 14-16, and 18 are directed to an emission control system.

The applicant appreciates the Examiner's withdrawal of the previous rejection using Shiraishi et al.

As a courtesy to the Examiner, the applicant provides a non-machine translation of Yokota. All references herein to Yokota are to the non-machine translation.

I. The Office Action

The Examiner objects to the pending claims as containing subject matter that was not described in the specification in such a way as to reasonable convey to one skilled in the art that the inventor, at the time the application was filed, had possession of the invention. More specifically, the Examiner submits it is unclear where the feature that the volume of the lean NOx catalyst system is 300% or greater than the of the volume of the oxidation catalyst system finds support in the applicant's specification. The Examiner submits that the specification only shows support for a lean NOx catalyst having a length that is 300% the length of the oxidation catalyst because there is no indication that the diameters of the catalyst systems, as exemplified in Example 1, are maintained constant.

Independent claims 9, 21, and 34 stand rejected under 35 U.S.C. §103(a) as obvious over Tsuchitani et al. (EP 0 666 099 A1) in view of Yokota et al. (JP 08-114116). More specifically, the Examiner states that Tsuchitani is silent with respect to the volume ratio between a lean NOx catalyst system and an oxidation catalyst system. The Examiner cites Yokota as disclosing that the volume of a low oxidation activity zone may be 10 or 20 times larger than the volume of a high oxidation activity zone. The motivation supplied by the Examiner to increase the volume of the lean NO_x catalyst system in Tsuchitani is because "configuring the lean NOx catalyst system to be significantly larger than the oxidation catalyst system improves the purification performance of the emission control system as taught by Yokota et al."

II. Written Description Requirement

MPEP 2163.02 provides that to satisfy the written description requirement, an applicant must convey with reasonable clarity to one skilled in the art that, as of the filing date sought, he or she was in possession of the invention, and that the invention, in that context, is whatever is now claimed. The Examiner has the initial burden of presenting by a preponderance of evidence why a person skilled in the art would not recognize in an applicant's disclosure a description of the invention defined by the claims. *In re Wertheim,* 541 F.2d 257, 262 (CCPA 1976).

The applicant submits that the specification conveys with reasonable clarity to one skilled in the art that, as of the filing date sought, the inventor had possession of the claimed feature: "the volume of the lean NO_x catalyst system is 300% or greater than that of the volume of the oxidation catalyst system." The Examiner arguments against the applicant is that only the length of the catalyst systems is disclosed in Example 1, item (5), not volume. The Examiner also points out that in addition to the catalyst length, the catalyst loading is also varied in Tests 1 and 2.

The Examiner's reference to Test 1 and Test 2 is irrelevant to the disclosure of Example 1 at page 6, line 17. Example 1, Table 3, item (5) clearly discloses the "300%" feature, wherein the lean-NOx catalyst is 9 inches long and the oxidation catalyst is 3 inches long, i.e., the lean-NOx catalyst is 300% longer than the oxidation catalyst. Furthermore, one of ordinary skill in the art would understand from Example 1 that the variables being investigated in the catalyst systems of Table 3 are: (i) the catalyst components in each system; and (ii) the total length of the catalyst bricks in the system. In other words, all other variables are maintained

constant (including the diameter of the catalyst brick). The applicant points out that the length of catalyst brick of the lean-NOx catalyst (3) is 12 inches, the same as the total length of the catalyst brick in the lean NOx catalyst + oxidation catalyst (5). The diameter of the catalyst bricks in both systems would have to be the same or a direct comparison could not be made; it would not be possible to draw a direct comparison between the catalyst systems and the conclusion at page 7, line 24-26. The applicant submits that this disclosure in the specification reasonably conveys to one of ordinary skill in the art that the inventor had possession of the claimed subject matter at the time of the application for patent. Reconsideration of the Examiner's objection is respectfully requested.

III. Nonobviousness

The Examiner states that Tsuchitani is silent with respect to the volume ratio between the lean NOx catalyst system and the oxidation catalyst system. The Examiner cites Yokota as disclosing that the volume of a low oxidation activity zone may be 10 or 20 times larger than the volume of a high oxidation catalyst activity zone. The motivation supplied by the Examiner to increase the volume of the lean NO_x catalyst system in Tsuchitani is because Yokota teaches "configuring the lean NOx catalyst system to be significantly larger than the oxidation catalyst system improves the purification performance of the emission control system."

A. Tsuchitani teaches away from increasing the catalyst volume.

It is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743 (Fed. Cir. 1983).

In a discussion regarding space velocity, Tsuchitani warns that when space velocity decreases below a pre-determined flow rate, the catalyst volume must be increased. When the catalyst volume is increased, "the diffusion in the flow path of the gas will bring about the influence of nullifying the effect of intermittently introducing the reducing substance or imparting a reducing atmosphere to the exhaust gas." Tsuchitani, page 7, lines 43-46.

Thus, Tsuchitani teaches away from increasing the catalyst volume. Therefore, the applicant submits that Tsuchitani should be removed as the primary reference in this rejection. One skilled in the art would not be motivated by Yokota (increasing the volume of a low oxidation catalyst activity zone) to modify Tsuchitani, when Tsuchitani explicitly teaches away from increasing the volume of the lean NO_x catalyst. For at least this reason, the Examiner's rejection is in error. Reconsideration is respectfully requested.

B. The "catalyst" in Tsuchitani is a combination of components.

The Examiner cites page 7, lines 47-55 of Tsuchitani as disclosing a lean-NOx catalyst system. In this passage, Tsuchitani describes a "catalyst." (In this Amendment, the applicant will use the word *catalyst* in quotation marks, e.g., "catalyst," to refer to the numerous components which are ultimately responsible for reducing NOx to N_2.) The "catalyst" of Tsuchitani comprises the following components:

(A) catalytically active components composed of:
  (a) at least one Nobel metal (an oxidizing component),
  (b) at least one alkali or alkaline earth metal (an adsorbent component); and
(B) a refractory inorganic oxide and optionally a heavy metal (a support).

The applicant also submits that the "catalyst" of Tsuchitani also includes a means to inject a reducing material onto the absorbent component because without such an injecting means, adsorbed NOx would never be released by the adsorbent in the form of N_2.

The above components that comprise the "catalyst" in Tsuchitani provide for the removal of NOx in the form of N_2 from exhaust gas under lean or oxidizing conditions. The "catalyst" functions by first oxidizing NOx (NO, N_2O etc) in exhaust gas to NO_2 with the oxidizing component (A)(a). The resulting NO_2 is adsorbed on the adsorbing component (A)(b). By injecting a reducing substance instantaneously into the exhaust gas enveloping the accumulated NO_2 on the adsorbent component, the adsorbed NO_2 is reduced and decomposed to N_2 to complete the removal of NOx. Tsuchitani, Page 5, lines 23-30. Thus, the "catalyst" in Tsuchitani is not a single component, but a collection of components which ultimately reduce NO_x to N_2 in exhaust gas.

As previously argued, and as reasserted herein, the applicant submits that the "catalyst" of Tsuchitani does not disclose the claimed "lean NOx catalyst platinum group metal (PGM) for reducing NOx to N_2." As described above, the "catalyst" in Tsuchitani is a multi-component system that includes component (A)(a), a catalyst responsible for oxidizing NOx to NO and N_2O and component (A)(b), which functions as an adsorbent, not a catalyst. The way in which N_2 is generated from the "catalyst" in Tsuchitani is by introducing the reducing substance onto the adsorbent component which releases NOx in the form of N_2 after exposure to a reducing material.

The applicant challenges the Examiner's assertion that Tsuchitani, page 7, lines 45-55 discloses the claimed lean NO_x catalyst system comprising a lean NOx catalyst platinum group metal (PGM) for reducing NOx to N_2 wherein the PGM consists of platinum and respectfully request reconsideration of the rejection. With regard to claims 36 and 37, the applicant strongly submits that the claim language where the lean NO_x catalyst system consists of a platinum catalyst having a defined loading coated on a surface area-enhancing washcoat for reducing NO_x to N_2 is not disclosed or suggested in Tsuchitani.

C. Yokota increases the volume of the low oxidation catalyst activity zone to allow the suppressed reduction reaction of NOx to N_2 to proceed to completion before the exhaust gas passes to the high oxidation catalyst activity zone.

Yokota is directed to a three-way catalyst for cleaning exhaust gas. The three-way catalyst has two zones: an upstream low oxidation activity zone and a downstream high oxidation activity zone. Yokota discloses that NOx cleaning (assumed to be NOx reduction) is not a preferred reaction when the exhaust gas air/fuel ratio is lean in the low oxidation activity zone. As taught by Yokota, this is because in a lean environment, oxidation of HC and CO is suppressed. Yokota, page 5, paragraph [0011] and page 9, paragraph [0033].

To overcome this problem, Yokota teaches that the path length of the exhaust flow in the low oxidation activity zone must be long enough for NOx cleaning to take place as exhaust gases flow through the zone. Page 7 paragraph [0023]. As a result, Yokota teaches that the volume of the low oxidation activity zone must be greater than the high oxidation activity zone. An increase in the volume of the low oxidation activity zone also increases the probability that the NOx will contact the three-way catalyst. Yokota teaches that if the volume ratio of the low and high oxidation activity zones is less than one, there is a possibility that exhaust gas will effuse from the low oxidation activity zone to the high oxidation activity zone before NOx cleaning is complete. Page 6 Paragraph [0020]. Accordingly, as stated by the Examiner, the purpose of increasing the length in Yokota, thereby increasing the volume of the low oxidation activity zone, is to allow the reduction reaction to reach completion thereby increasing the purification performance of the emission control system.

D. The Examiner's characterization that Tsuchitani's "catalyst" is a lean NOx catalyst system lacks specificity.

The applicant submits that the Examiner's rejection is in error because it lacks specificity. In an anticipatory and obviousness-type rejection, in order for a prior art reference

to be considered as disclosing a feature of the claim, the identical feature must be shown in as complete detail as is contained in the claim. *See e.g., Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236 (Fed. Cir. 1989). The Examiner has not specifically identified which component of the "catalyst" in Tsuchitani discloses the claimed lean NOx catalyst system comprising a lean NOx catalyst platinum group metal (PGM) for reducing NOx to N_2 wherein the PGM consists of platinum. In fact, the Examiner acknowledges that the "catalyst" of Tsuchitani is made up of several components that ultimately reduce NO_x to N_2 (discussed in more detail below). As a consequence, one skilled in the art would not understand which component of the "catalyst" in Tsuchitani should be increased in volume in order to obtain an increase in the purification performance as taught by Yokota. The applicant respectfully requests the Examiner to specifically point out why one skilled in the art would enlarge a component or the entire "catalyst" of Tsuchitani. Without this teaching, the applicant submits that the Examiner's rejection is in error.

E. The differences between the emissions control system of Tsuchitani and Yokota prevent one skilled in the art from applying the teaching of Yokota to Tsuchitani.

The applicant submits that the reason the Examiner cannot identify with specificity which component of Tsuchitani should be increased in volume as taught by Yokota in the rejection is because a comparison of the exhaust systems of Tsuchitani and Yokota reveals that these two systems are vastly different in structure and function. These differences prevent one skilled in the art from applying the teachings of Yokota to the emissions control system of Tsuchitani.

The structural components of the emissions control system in Tsuchitani and Yokota are so different that one skilled in the art would not understand how to apply the teachings of Yokota to the emissions control systems of Tsuchitani. For example, the "catalyst" of Tsuchitani does not disclose a low oxidation catalyst activity zone. Similarly, Yokota does not disclose components such as an oxidation component, adsorbent component, and a means for injection a reducing material. Structurally, these two emission control systems are very different.

The process of removing NOx carried out by the emissions control system of Tsuchitani and Yokota are also so different that one skilled in the art would not understand how to apply the teachings of Yokota to the emissions control system of Tsuchitani. For example, the "catalyst" in Tsuchitani uses the lean conditions of the exhaust gas to first oxidize the NOx species, then adsorb the oxidized NOx on an adsorbent, and later remove the NOx from the adsorbent with a reducing material. Yokota, on the other hand, recognizes that the reduction

reaction of NOx in an lean environment is suppressed, and proceeds slowly at best. To combat this problem, Yokota does not use the excess oxygen in the lean environment to first oxidize the NOx species or use an absorbent component, but instead, Yokota increases the volume of the low oxidation activity zone to provide the suppressed NOx reduction reaction ample time to reach completion. Although Tsuchitani and Yokota both ultimately remove NOx from exhaust gas, they achieve this result using vastly different processes.

The structure and the process by which NOx removal is carried out are vastly different in the emission control systems of Tsuchitani and Yokota. As a consequence, the teaching of Yokota to increase the volume of the low oxidation activity zone is not capable of being carried out or put into practice by one skilled in the art in the "catalyst" of Tsuchitani. That is, the suggested modification as taught by Yokota destroys the intended purpose of Tsuchitani. For at least this reason, the Examiner's rejection is in error. The applicant respectfully requests reconsideration of the rejection.

F. There is no likelihood of success that increasing the "catalyst" volume in Tsuchitani would necessarily increase the purification performance of Tsuchitani's emission control system.

The prior art can only be modified to reject claims as *prima facie* obvious when there is a reasonable expectation of success of the modification. *In re Merck & Co., Inc.*, 800 F.2d 1091 (Fed. Cir. 1986). The applicant submits that the Examiner failed to provide a likelihood that increasing the volume of the "catalyst" in Tsuchitani would successfully result in an increased purity of the resultant exhaust gas of Tsuchitani's exhaust system.

For completeness, even if there was proper motivation from Yokota, the applicant discusses the lack of a likelihood that increasing the volume of a component of the "catalyst" or increasing the volume of the entire "catalyst" of Tsuchitani would successfully result in increased purification performance of Tsuchitani's emission control system.

1. Enlarging the oxidation catalyst (A)(a) of the catalytically active component.

If the oxidation catalyst component were enlarged, the applicant submits that no significant increase in the purification performance of Tsuchitani's emission control system would occur. The applicant submits that enlarging the oxidation catalyst would merely increase the capacity of the system to handle larger volumes of input exhaust gases. Increasing the oxidation catalyst would not increase Tsuchitani's emission control system purification

performance. Moreover, if just the oxidation component of the "catalyst" in Tsuchitani were increased in volume, the applicant submits that Yokota's teaching of increasing the volume of a low oxidation activity zone would not be proper motivation to one skilled in the art.

2. Enlarging the adsorbent component (A)(b) of the catalytically active component.

If the adsorbent component were enlarged, the applicant submits that no significant increase in the purification performance of Tsuchitani's emission control system would occur. The applicant submits that enlarging the adsorbent component would merely increase the capacity for the adsorbent to accumulate oxidized NOx. This would have the effect of reducing the frequency with which the adsorbent would need to be recharged by the introduction of the reducing material. The applicant submits that increasing the volume of the adsorbent component would not increase Tsuchitani's emission control system purification performance.

3. Enlarging the entire "catalyst."

If the entire "catalyst" were enlarged, the applicant submits that no significant increase in the purification performance of Tsuchitani's emission control system would occur. The applicant submits that enlarging the "catalyst" would merely increase the capacity of the emission control system in Tsuchitani. No increase in the purification performance would result.

G. Disclosed inherent properties are part of "as a whole" inquiry; the Examiner has applied impermissible hindsight.

In delineating the invention as a whole, we look not only to the subject matter which is literally recited in the claim in question... but also to those properties of the subject matter which are inherent in the subject matter *and* are disclosed in the specification. . . it is this invention *as a whole,* and not some part of it, which must be obvious under 35 U.S.C. 103. *In re Antonie*, 559 F.2d 618, 620 (CCPA 1977).

The Examiner's basis for selecting Tsuchitani as the primary reference includes the observation that the platinum loading in the NOx trap of Tsuchitani overlaps the range of less than 30g per cubic foot. The Office Action states: "it therefore follows that the two catalysts would inherently exhibit similar properties under similar conditions." (see Office Action at page 10, first paragraph). However, the applicant has observed that a platinum loading of less than 30g per cubic foot actually does promote improved NOx conversion, and Tsuchitani is completely silent about the lower Pt loading improving NOx conversion. In the present case,

whilst improved lean NOx activity is inherent in the use of the lower PGM loading in Tsuchitani, the fact that the lower PGM loading is responsible for improved lean NOx activity is not specifically disclosed in Tsuchitani. It appears that the Office Action is using the teaching of applicant's own invention against the pending claims, that is, the Office Action is applying inadmissible hindsight to read in this undisclosed and secret property into Tsuchitani. As a result, the Office Action rejection has not correctly applied the "as a whole" requirement. Reconsideration of the rejection is respectfully requested.

Where the Office Action applies impermissible hindsight is in imporingt into Tsuchitani the teaching of the claimed invention, i.e., that the lower Pt loading inherently improves NOx reduction. The Office Action compounds this error by determining that the motivation to combine Tsuchitani with Yokota is "to select an appropriate volume for the lean NOx catalyst system relative to the oxidation catalyst system in the process and apparatus of Tsuchitani on the basis of suitability for the intended use." (see page 5, final paragraph of the office action). Tsuchitani teaches primarily the adsorption of NOx in lean conditions for later reduction, not a catalytic reaction of reducing NOx to N_2 over a single catalyst component.

The applicant submits that one of ordinary skill in the art would not have been led to combine Tsuchitani and Yokota without reading into Tsuchitani that lower Pt loadings improve NOx reduction activity. Reconsideration of the rejection is respectfully submitted.

IV. The applicant's comments on the Examiner's response to the applicant's previous arguments.

The applicant apologizes for any confusion to the citation of paragraph numbers in Tsuchitani. The applicant was reviewing Tsuchitani EP 0 666 999 B1 instead of EP 0 666 999 A1.

The Examiner states that the function of the "catalyst" in Tsuchitani is to ultimately reduce NOx to N_2:

> Although the catalyst may exhibit an intermediate step of oxidizing or activating NOx, in order to adsorb the NOx on the surface of the catalyst, the catalyst ultimately functions to reduce and decompose NOx in the presence of a reducing agent, and therefore, the catalyst system of Tsuchitani et al. meets the claim of a lean NOx catalyst system for reducing NOx to N_2.

The applicant submits that with this statement, the Examiner acknowledges that no single component of the "catalyst" of Tsuchitani acts as a lean-NOx catalyst, but that the end result of the "catalyst" is the reduction of NOx. This acknowledgement i) supports the applicant's position enumerated above that there is a lack of specificity as to which component or the entire "catalyst" of Tsuchitani is to be increased in volume, and ii) supports the applicant's position that the process feature of claim 21 reciting "introducing additional hydrocarbon fuel into the exhaust gas before the exhaust gas contacts the lean NOx catalyst system" is not rendered obvious by the combination of Tsuchitani and Yokota.

Point i) is addressed in detail in sections III(B) and (D). The applicant submits that the Examiner's acknowledgement that no single component of the "catalyst" in Tsuchitani is responsible for reducing NOx, but that the ultimate outcome is NOx reduction is evidence that the Examiner's rejection lacks specificity. That is, the general teaching of Yokota to enlarge a low oxidation activity zone does not show with sufficient specificity how one skilled in the art would enlarge the volume of a component of or the entire "catalyst" of Tsuchitani.

Point ii) supports the applicant's position that the process features of claim 21 are not found in the combination or modification of Tsuchitani and Yokota. The Examiner characterizes Tsuchitani's "catalyst" as including intermediary steps and that Tsuchitani's "catalyst" ultimately reduces NOx to N_2. Following the Examiner's logic, Tsuchitani's "catalyst," as described above, therefore is a system that includes all those components and structures responsible for reducing NOx to N_2. This system includes the oxidizing component, the adsorbent component, and the means to inject a reducing material (because the reducing material is responsible for desorbing the accumulated NOx from the adsorbent in the form of N_2). Thus, the means for injecting the reducing material, as defined by the Examiner, is part of Tsuchitani's catalyst. Tsuchitani does not disclose any other means to inject a reducing material upstream of the lean NO_x catalyst.

In contrast, process claim 21 requires "introducing additional hydrocarbon fuel into the exhaust gas before the exhaust gas contacts the lean NOx catalyst system." Because process claim 21 specifically requires that the addition of hydrocarbon fuel is injected before the exhaust gas passes into the lean NOx catalyst system, and the "catalyst" in Tsuchitani is defined to include the means to inject a reducing material, the applicant respectfully submits that this process step of claim 21 is neither disclosed nor rendered obvious by Tsuchitani and the art of record. Reconsideration with respect to the process claims is respectfully requested.

The applicant notes that the Examiner also references Fig. 1 as disclosing that the means for injection a reducing material is upstream of the lean NOx catalyst of Tsuchitani. (See page 4 of the Office Action). The applicant finds no disclosure in Tsuchitani identifying the references numerals of Fig. 1. The applicant therefore requests that the Examiner more specifically identify the page and line number(s) in the text of Tsuchitani to support her assertion.

V. Conclusion

With this amendment, the applicant has clearly identified why one of ordinary skill in the art would understand that the applicant had in its possession at the time of filing, an emission control system wherein "the volume of the lean NOx catalyst system is 300% or greater than that of the volume of the oxidation catalyst system."

With respect to the obviousness rejection, the applicant continues to assert that Tsuchitani fails to disclose with sufficient specificity "a lean NOx catalyst system comprising a lean NOx catalyst platinum group metal (PGM) for reducing NOx to N_2 wherein the lean NOx catalyst PGM consists of platinum." In addition, the applicant has pointed out why there is no motivation to apply the teachings of Yokota to Tsuchitani because 1) one of ordinary skill in the art would not understand from the general teaching of Yokota which component of the "catalyst" of Tsuchitani to increase in volume and 2) there is no likelihood of success that if the volume of a component of or the entire "catalyst" of Tsuchitani were increase, such an increase would improve the purification performance of Tsuchitani's emission control system.

For these above reasons, the applicant respectfully requests the Examiner to reconsider the rejection, particularly with respect to the remarks regarding Tsuchitani.

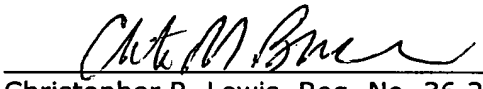
VI. Fees

The fee for additional claims is calculated as follows:

	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST # PREV. PAID FOR		NUMBER EXTRA CLAIMS PRESENT	RATE	ADDITIONAL FEE
TOTAL CLAIMS	23	-	26	=	0	x $50.00	$ 0
INDEP. CLAIMS	5	-	3	=	2	x $200.00	$ 400
					TOTAL ADDITIONAL FEE FOR THIS AMENDMENT		$ 400

The fee is to be charged to a credit card. A Credit Card Payment Form (PTO-2038) is enclosed.

Respectfully submitted,



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CMB/lrb
Enclosures: Non-machine translation of Yokota (JP 8-114116)
PTO-2038

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The Commissioner for Patents is hereby authorized to charge payment to Deposit Account No. **18-0350** of any fees associated with this communication.

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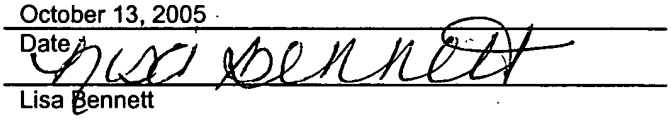

Lisa Bennett

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